REFERENCES 55

[45] S. Narayan, C. Disselkoen, D. Moghimi, S. Cauligi, E. Johnson, Z. Gang, A. Vahldiek-Oberwagner, R. Sahita, H. Shacham, D. Tullsen, et al., "Swivel: Hardening webassembly against spectre," in USENIX Security Symposium, 2021.

- [46] E. Johnson, D. Thien, Y. Alhessi, S. Narayan, F. Brown, S. Lerner, T. McMullen, S. Savage, and D. Stefan, "Sfi safety for native-compiled wasm," NDSS. Internet Society, 2021.
- [47] J. Cabrera-Arteaga, N. Fitzgerald, M. Monperrus, and B. Baudry, "WASM-MUTATE: Fast and Effective Binary Diversification for WebAssembly," *arXiv* e-prints, p. arXiv:2309.07638, Sept. 2023.
- [48] M. Willsey, C. Nandi, Y. R. Wang, O. Flatt, Z. Tatlock, and P. Panchekha, "Egg: Fast and extensible equality saturation," Proc. ACM Program. Lang., vol. 5, jan 2021.
- [49] A. Homescu, S. Neisius, P. Larsen, S. Brunthaler, and M. Franz, "Profile-guided automated software diversity," in *Proceedings of the 2013 IEEE/ACM International Symposium on Code Generation and Optimization (CGO)*, pp. 1–11, IEEE, 2013.
- [50] D. Cao, R. Kunkel, C. Nandi, M. Willsey, Z. Tatlock, and N. Polikarpova, "Babble: Learning better abstractions with e-graphs and anti-unification," *Proc. ACM Program. Lang.*, vol. 7, jan 2023.
- [51] R. Tate, M. Stepp, Z. Tatlock, and S. Lerner, "Equality saturation: A new approach to optimization," in *Proceedings of the 36th Annual ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages*, POPL '09, (New York, NY, USA), p. 264–276, Association for Computing Machinery, 2009.
- [52] S. Narayan, C. Disselkoen, D. Moghimi, S. Cauligi, E. Johnson, Z. Gang, A. Vahldiek-Oberwagner, R. Sahita, H. Shacham, D. Tullsen, and D. Stefan, "Swivel: Hardening WebAssembly against spectre," in 30th USENIX Security Symposium (USENIX Security 21), pp. 1433–1450, USENIX Association, Aug. 2021.
- [53] T. Schnitzler, K. Kohls, E. Bitsikas, and C. Pöpper, "Hope of delivery: Extracting user locations from mobile instant messengers," in 30th Annual Network and Distributed System Security Symposium, NDSS 2023, San Diego, California, USA, February 27 March 3, 2023, The Internet Society, 2023.
- [54] S. Cao, N. He, Y. Guo, and H. Wang, "WASMixer: Binary Obfuscation for WebAssembly," arXiv e-prints, p. arXiv:2308.03123, Aug. 2023.

56 REFERENCES

[55] A. Hilbig, D. Lehmann, and M. Pradel, "An empirical study of real-world webassembly binaries: Security, languages, use cases," *Proceedings of the Web Conference 2021*, 2021.

- [56] Kaspersky, "The state of cryptojacking in the first three quarters of 2022," 2022.
- [57] Mozilla, "Protections Against Fingerprinting and Cryptocurrency Mining Available in Firefox Nightly and Beta," 2019.
- [58] S. Bhansali, A. Aris, A. Acar, H. Oz, and A. S. Uluagac, "A first look at code obfuscation for webassembly," in *Proceedings of the 15th ACM Conference on Security and Privacy in Wireless and Mobile Networks*, WiSec '22, (New York, NY, USA), p. 140–145, Association for Computing Machinery, 2022.
- [59] J. Cabrera-Arteaga, M. Monperrus, T. Toady, and B. Baudry, "Webassembly diversification for malware evasion," *Computers & Security*, vol. 131, p. 103296, 2023.
- [60] E. Tekiner, A. Acar, A. S. Uluagac, E. Kirda, and A. A. Selcuk, "Inbrowser cryptomining for good: An untold story," in 2021 IEEE International Conference on Decentralized Applications and Infrastructures (DAPPS), pp. 20–29, 2021.
- [61] P. Kocher, J. Horn, A. Fogh, D. Genkin, D. Gruss, W. Haas, M. Hamburg, M. Lipp, S. Mangard, T. Prescher, M. Schwarz, and Y. Yarom, "Spectre attacks: Exploiting speculative execution," in 2019 IEEE Symposium on Security and Privacy (SP), pp. 1–19, 2019.

## ${f Part~II}$ Included papers